FORM PTO-1390 (REV 10-94) U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: 10921.99USWO

U S APPLICATION NO (If known, see 37 C F R 1.5): UNKNOWN 09/890758

INTERNATIONAL APPLICATION NO	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/JP00/00578	FEBRUARY 2, 2000	FEBRUARY 12,1999

TITLE OF INVENTION

IMAGE SENSOR AND TRANSPARENT COVER FOR THE SAME

APPLICANT(S) FOR DO/EO/US

ONISHI, HIROAKI; FUJIMOTO, HISAYOSHI

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [X] This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(l).
4. [X] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [ ] is transmitted herewith (required only if not transmitted by the International Bureau).
   b. [X] has been transmitted by the International Bureau
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US)
6. [X] A translation of the International Application into English (35 U.S.C. 371(c)(2)).

7. [X] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] have been transmitted by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [X] have not been made and will not be made.
8. [ ] A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. [X] An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. [X] A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. [X] An Information Disclosure Statement under 37 CFR 1.97 and 1.98, form 1449, 3 references.
12. [x] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [X] A FIRST preliminary amendment.
    [ ] A SECOND of SUBSEQUENT preliminary amendment.
14. [ ] A substitute specification
15. [ ] A change of power of attorney and/or address letter.
16. [x] Other items or information: PCT/IB/304, PCT/IB/308, PCT/IB/332, PCT/ISA/210, PCT/IPEA/409, Preliminary Amendment, Amended Claims under PCT Article 34, Front Page of PCT/JP00/00578, Certification of Translation of the same

U.S. APPLICATION NO (If known, see 37 C F R 1 5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
UNKNOWN 09/890758	PCT/JP00/00578	10921.99USWO

17. [X] The following fees are submitted:	CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492(a) (1)-(5)):		
Search Report has been prepared by the EPO or JPO **$860.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.492(a)(1)) **$690.00**		
No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) **$710.00**		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(3)) paid to USPTO **$1000.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) **$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	**$860.00**	
Surcharge of **$130.00** for furnishing the oath or declaration later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	**$0**	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	15 -20 =	0	X **$18.00**	**$0**	
Independent claims	4 -3 =	1	X **$80.00**	**$80.00**	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$260.00**	**$0**	
TOTAL OF ABOVE CALCULATIONS =				**$940.00**	
Reduction by 1/2 for filing by small entity, if applicable. Small entity status is claimed pursuant to 37 CFR 1 27				**$0**	
SUBTOTAL =				**$940.00**	
Processing fee of **$130.00** for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(f).			+	**$0**	
TOTAL NATIONAL FEE =				**$940.00**	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40.00 per property			+	**$40.00**	
TOTAL FEES ENCLOSED =				**$980.00**	
				Amount to be: refunded	**$0**
				charged	**$0**

a. [X] Check(s) in the amount of $940.00 and $ 40.00 to cover the above fees is enclosed.

b. [ ] Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 13-2725.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO
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NAME: Douglas P. Mueller

REGISTRATION NUMBER: 30,300

S/N unknown

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Onishi, et al.	Docket No.:	10921.99USWO
Serial No.:	unknown	Filed:	concurrent herewith
Int'l Appln No.:	PCT/JP00/00578	Int'l Filing Date:	February 2, 2000
Title:	IMAGE SENSOR AND TRANSPARENT COVER FOR THE SAME		

CERTIFICATE UNDER 37 CFR 1.10
'Express Mail' mailing label number: EL658338650US
Date of Deposit: August 2, 2001
I hereby certify that this paper or fee is being deposited with the United States Postal Service 'Express Mail Post Office To Addressee' service under 37 CFR 1.10 and is addressed to the Commissioner for Patents, Washington, D.C. 20231

By: Omesh Singh
Name: Omesh Singh

PRELIMINARY AMENDMENT

Box PCT
Assistant Commissioner for Patents
Washington, D. C. 20231

Dear Sir:

In connection with the above-identified application filed herewith, please enter the following preliminary amendment, which is based on the Article 34 amendments, based on claims amended in prosecution of the international application and published in the International Preliminary Examination Report, a copy of which is enclosed herewith:

IN THE ABSTRACT

Insert the attached Abstract page into the application as the last page thereof.

IN THE SPECIFICATION

A courtesy copy of the present specification is enclosed herewith. However, the World Intellectual Property Office (WIPO) copy should be relied upon if it is already in the U.S. Patent Office.

REMARKS

A new abstract page is supplied to conform to that appearing on the publication page of the WIPO application, but the new Abstract is typed on a separate page as required by U.S. practice. Applicants confirm that the Article 34 Amendment from the international stage should be entered for examination. A translation is provided herewith.

Applicants respectfully request that the preliminary amendment described herein be entered into the record prior to calculation of the filing fee and prior to examination and consideration of the above-identified application.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicants' primary attorney-of record, Douglas P. Mueller (Reg. No. 30,300), at (612) 371.5237.

Respectfully submitted,

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Dated: August 2, 2001

By _____
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DPM/rw

CLAIMS

(Amended under PCT Article 34)

1. (Amended) An image sensor comprising:

a transparent cover having a first surface on an image reading region side, and a second surface away from the first surface;

a light source throwing light to the image reading region from a second-surface side of the transparent cover; and

a plurality of light receiving elements each receiving reflected light from the image reading region and outputting an image signal corresponding to an amount of the light received;

characterized that the transparent cover includes a transparent main body of a synthetic resin, and a transparent glass member corresponding to the image reading region,

that the transparent main body has a groove corresponding to the image reading region, the transparent glass member being placed in the groove; and

that the transparent main body and the transparent glass member each has a surface which is flush with each other and provides the first surface.

2. (Deleted)

3. (Amended) The image sensor according to Claim 1, wherein the groove is provided by a through hole formed in the transparent cover.

4. (Deleted)

5. (Amended) An image sensor comprising:

a transparent cover having a first surface on an image reading region side, and a second surface away from the first surface;

a light source throwing light to the image reading region from a second-surface side of the transparent cover; and

a plurality of light receiving elements each receiving reflected light from the image reading region and outputting an image signal corresponding to an amount of the light received;

characterized that the transparent cover includes a transparent main body of a synthetic resin, and a transparent glass member corresponding to the image reading region,

that the transparent main body has a groove corresponding to the image reading region, the transparent glass member being placed in the groove,

that the transparent glass member is exposed on a first-surface side, and

that the image reading region is linear, the transparent

cover having a nontransparent region corresponding to an end portion of the image reading region.

6. (Amended) The image sensor according to Claim 5, wherein the nontransparent region is formed with a white spot or a black spot.

7. The image sensor according to Claim 5, wherein the nontransparent region is formed with both of the white spot and the black spot.

8. (Amended) The image sensor according to Claim 5, wherein the image reading region is linear, the transparent cover having a nontransparent region corresponding to the other end portion of the image reading region.

9. The image sensor according to Claim 8, wherein one of the nontransparent regions is formed with a white spot and the other is formed with a black spot.

10. The image sensor according to Claim 5, wherein the nontransparent region is provided by a part of the glass member rendered nontransparent.

11. The image sensor according to Claim 10, wherein the nontransparent region is provided by a part of the glass member applied with a coating.

12. The image sensor according to Claim 10, wherein the nontransparent region is provided by a nontransparent member pasted to a part of the glass member.

13. The image sensor according to Claim 5, wherein the nontransparent region is provided by a nontransparent member separate from the glass member and the cover main body, placed in the groove.

14. The image sensor according to Claim 13, wherein the groove is divided into a glass member receiving portion for receiving the glass member and a nontransparent member receiving portion for receiving the nontransparent member.

15. (Amended) A transparent cover for image sensor, comprising a transparent main body of a synthetic resin, and a transparent glass member placed in a groove formed in a surface of the cover member,

the groove having at least a longitudinal end portion provided with a nontransparent region.

16. (Amended) A transparent cover for image sensor, comprising a transparent main body of a synthetic resin, and a transparent glass member placed in a groove formed in a surface of the cover member,

the transparent main body and the transparent glass

member each having a surface flush with each other and providing the first surface.

17. (Amended) The transparent cover according to Claim 16, further comprising a nontransparent region provided at least at one longitudinal end portion of the groove.

SPECIFICATION

IMAGE SENSOR AND TRANSPARENT COVER FOR THE SAME

Technical Field

The present invention relates to an image sensor for reading a document image, and a transparent cover for the image sensor.

Background Art

An example of the image sensor is a contact type image sensor. The contact type image sensor generally comprises a case, a transparent cover attached to the case, a light source, a lens array including a plurality of optical lenses, and a plurality of light receiving elements. When reading an image, the document is placed on the transparent cover, and the light source throws light towards the transparent cover from inside the case.

According to such a contact type image sensor as the above, the light from the light source illuminates the document placed on the transparent cover. The illumination covers a range including a linear image-reading region of the document. Light reflected in the image reading region is focused by the lens array, providing an image of the document on the light receiving elements, causing each of the light receiving elements to output an image signal of a level corresponding to an amount of light received.

The transparent cover attached to the case seals the case thereby preventing dirt from coming into the case as well as guiding the document. Also, the transparent cover provides a predetermined distance between the document and the lens array, thereby allowing the document image to appropriately focus on the light receiving elements.

Conventionally, the transparent cover is entirely made of glass or entirely made of resin, and therefore associated with the following problems.

Specifically, if the transparent cover is entirely made of glass, the cover can be broken easily upon impact given to the image sensor, with the broken pieces of glass scattering instantly. This problem is more serious if the image sensor is used as a handy scanner, which can be accidentally dropped by the user.

On the other hand, if the transparent cover is entirely made of synthetic resin, the cover is more impact resistant and is less susceptible to cracking for example. However, the synthetic resin cover has a low surface hardness as compared with the glass cover, and therefore is more susceptible to surface damage. For example, contact with a platen roller, dirt inclusion and so on can damage the surface relatively easily, deteriorating light transmission (transparency) of the transparent cover. The surface damage of the transparent cover causes distortion when reading the image, resulting in a problem of decreased quality of the read image.

Conventionally, in an attempt to solve these problems, there is available a transparent cover made of synthetic resin having an upper surface formed with a groove, and image reading of the document is performed by utilizing the groove. A transparent cover formed with such a groove does not allow the platen roller to contact the transparent cover even if the platen roller is faced to the groove for example. Therefore, the transparent cover is not damaged by the contact with the platen roller. However, a transparent cover having such a groove has another problem of frequent jamming of the document, since the groove can easily catch a front edge of the document being fed by the platen roller. Still another problem is that the transparent cover having such a groove as the above easily collect dirt in the groove. The dirt in the groove decreases transparency of the groove of the transparent cover, and can be a cause of trouble in the reading of the document image.

On the other hand, the image sensor should desirably have capability to adjust output level of the read image. The output level adjustment can be achieved by e.g. using a method commonly called "white level adjustment" or simply "darkness adjustment". According to this method, before reading the document image, reading of a white platen roller faced to the transparent cover is preformed to obtain an image signal representing a white image. Next, determination is made whether or not the output level of this image signal is appropriate. If the output level is not appropriate,

adjustment is made to a light source voltage or to sensitivity of the light receiving elements, based on the current output level, so that the output level for the white image comes to a predetermined appropriate level. Amount of light emission from the light source provided by e.g. LEDs, is influenced by temperature. Likewise, the sensitivity of the light receiving elements provided by semiconductors fluctuates with ambient temperature changes. The output level adjustment for the white image performed in accordance with the above described method is made under a condition representing a realistic operating condition, i.e. under an actual operating temperature. This makes sure that the image reading operation is performed, with the output level appropriately adjusted to the actual operating temperature. As a result, a read image true to the document image is obtained. Conventionally however, if the image sensor is utilized in e.g. the handy scanner, it is not possible to perform such an output level adjustment by using the white platen roller, since the handy scanner is not provided with the platen roller. Therefore, the conventional image sensor is problematic also in such a sense as the above.

DISCLOSURE OF THE INVENTION

It is therefore an object of the present invention to increase impact resistance of the transparent cover and to reduce susceptibility of the transparent cover to flaw that interferes with image reading operation, thereby

facilitating the image reading operation without causing such a problem as document jamming.

According to a first aspect of the present invention, an image sensor is provided. This image sensor comprises: a transparent cover having a first surface on an image reading region side, and a second surface away from the first surface; a light source throwing light to the image reading region from a second-surface side of the transparent cover; and a plurality of light receiving elements each receiving reflected light from the image reading region and outputting an image signal corresponding to an amount of the light received. The image sensor is characterized in that the transparent cover includes a transparent main body of a synthetic resin and a transparent glass member corresponding to the image reading region, and that the transparent glass member is exposed on a first surface side of the transparent cover.

According to the image sensor with the above arrangement, first, part of the transparent cover surface corresponding to the image reading region is provided by a glass surface. Therefore, this particular part is no longer prone to damage, eliminating or at least reducing the problem of decreased quality of a read image due to surface damage in the transparent cover. Second, the cover main body, which is a main component of the transparent cover, is made primarily of synthetic resin, and the glass member is utilized only partially. This makes it possible to increase impact

resistance of the cover main body thereby making it less prone to crack and other damages, as well as facilitating weight reduction of the image sensor. Thus, the image sensor according to the present invention is particularly suitable for a handy scanner in which weight reduction is highly required.

Preferably, the transparent main body has a groove corresponding to the image reading region, and the transparent glass member is placed in the groove. Also, preferably, the groove is provided by a through hole formed in the transparent cover.

According to an image sensor with such arrangements as the above, the glass member is protected by the cover main body, and therefore it becomes possible to give increased protection from damage, not only to the cover main body but also to the glass member. Thus, the image sensor according to the present invention is particularly suitable for a handy scanner which is prone to impact.

Preferably, the transparent main body and the transparent glass member each have a surface flush with each other and these surfaces provide the first surface.

According to an image sensor of such an arrangement as the above, the cover main body and the glass member provided therein form a flat surface without stepped level differences. Therefore, when the image sensor according to the present invention is utilized in an image reading apparatus, it becomes possible not to let a document be caught by the

transparent cover surface during image reading operation. Also, even if the transparent main body has a groove, it becomes possible not to allow dirt to build in the groove. Therefore, the image reading operation can be performed appropriately.

Preferably, the image reading region is linear, and the transparent cover has a nontransparent region corresponding to at least one end portion of the image reading region.

Such an arrangement enables to provide a nontransparent region without interfering with normal image reading operation and also to perform image reading operation for the nontransparent region. By utilizing the image signal obtained by reading the nontransparent region, an output level adjustment of the read image which is the same as or similar to the "white level adjustment" described earlier can be performed. Therefore, even if the image sensor is utilized in a handy scanner which does not have a platen roller, an output level adjustment of the read image can be performed according to the present invention. Therefore, the present invention enables to obtain a high quality read image superior in image reproducibility.

Preferably, the nontransparent region is formed with at least one of a white spot and a black spot. Further, preferably, the nontransparent region is formed with both of the white spot and the black spot.

According to such arrangements, when performing the output level adjustment of the read image after performing

image reading of the nontransparent region, the output level adjustment can be made appropriately, based on both or one of the image signal representing the white spot and the image signal representing the black spot.

Preferably, the image reading region is linear, and the transparent cover has nontransparent regions respectively corresponding to end portions of the image reading region.

Preferably, one of the nontransparent regions is formed with a while spot, and the other is formed with a black spot.

Preferably, the nontransparent region is provided by a part of the glass member rendered nontransparent. More preferably, the nontransparent region is provided by a part of the glass member applied with a coating. Also, more preferably, the nontransparent region is provided by a nontransparent member pasted to a part of the glass member.

According to such arrangements, there no longer is need for first preparing a dedicated nontransparent member separately from the glass member, and then assembling the dedicated member to the transparent cover as means for providing the nontransparent region in the transparent cover. Therefore, it becomes possible to restrict increase in the number of parts necessary for the transparent cover, and increase in manufacturing cost.

Preferably, the nontransparent region is provided by a nontransparent member separate from the glass member and the cover main body, placed in the groove.

With such an arrangement, although it is necessary to prepare a nontransparent member separately from the main body and the glass member, assembling operation of the nontransparent member to the cover main body can be performed easily by simply fitting the member into the groove of the cover main body.

Preferably, the groove is divided into a glass member receiving portion for receiving the glass member and a nontransparent member receiving portion for receiving the nontransparent member.

According to a second aspect of the present invention, a transparent cover for image sensor is provided. This transparent cover comprises a transparent main body of a synthetic resin and a transparent glass member placed in a groove formed in a surface of the main body.

When utilizing such a transparent cover for image sensor, the groove in the cover main body and the glass member fitted therein are placed in an image reading region of the image sensor. This provides the same effect as offered by the image sensor provided by the first aspect of the present invention.

Preferably, the transparent glass member placed in the groove has a surface flush with a surface of the transparent main body.

According to the image sensor of a structure such as the above, the cover main body and the glass member provided therein form a flat surface without stepped level differences. This provides the same effect as offered by the image sensor

provided by the first aspect of the present invention.

Preferably, the transparent cover further comprises a nontransparent region provided at least at one longitudinal end portion of the groove.

According to such an arrangement, when placing the groove in the cover main body and the glass member fitted therein are placed in a linear image reading region of the image sensor, it becomes possible to dispose the nontransparent region at a longitudinal end portion of the image reading region. Thus, by performing image reading of the nontransparent region, the above described output level adjustment of the read image can be performed.

Other objects, characteristics, and advantages of the present invention will become clear from the following description of embodiments to be presented with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a transparent cover for image sensor, according to the present invention.

Fig. 2 is a sectional view taken in lines II-II in Fig. 1.

Fig. 3 is a sectional view taken in lines III-III in Fig. 1.

Fig. 4 is an explosive view of the transparent cover shown in Fig. 1 through Fig. 3.

Fig. 5 is a sectional view showing an example of how glass is fixed to a cover main body of the transparent cover.

Fig. 6 is a sectional view showing another example of how glass is fixed to a cover main body of the transparent cover.

Fig. 7 is a sectional view showing an image sensor according to the present invention.

Fig. 8 is a sectional view taken in lines VIII-VIII in Fig. 7.

Fig. 9 is a sectional view showing another image sensor according to the present invention.

Fig. 10 is a sectional view showing still another image sensor according to the present invention.

Fig. 11 is a sectional view showing another transparent cover for image sensor, according to the present invention.

Fig. 12 is a sectional view showing another transparent cover for image sensor, according to the present invention.

Fig. 13 is a sectional view showing another transparent cover for image sensor, according to the present invention.

Fig. 14 is a sectional view showing another transparent cover for image sensor, according to the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

Now, preferred embodiments of the present invention will be described specifically, with reference to the attached drawings.

Referring to Fig. 1 through Fig. 4, a transparent cover 1 for image sensor, according to the present embodiment

comprises a cover main body 10 and a glass bar 20.

The cover main body 10 is made of a synthetic transparent resin such as polymethyl methacrylate (PMMA) and polycarbonate (PC), and is formed into a rectangular plate as a whole. The cover main body 10 has a surface 10a (an upper surface of the cover main body 10 as in Figs. 1 through 4) formed with a straight groove 11 longitudinally of the cover main body 10. The groove 11 has a constant width and a constant depth. The cover main body 10 has longitudinal edges respectively provided with engaging projections 12a, 12b.

The glass bar 20 is made of a transparent glass material. As shown in Figs. 1, 2 and 4, the glass bar 20 is provided with a nontransparent region 3. The nontransparent region 3 includes a white spot 30 provided by a white coating and, a black spot 31 provided by a black coating. The coatings are made side by side on a back surface of a longitudinal end portion 20b of the transparent glass bar 20. Alternatively, the coatings may not only cover the back surface of the end portion 20b of the glass bar 20 but also cover the upper surface and/or side surfaces.

The glass bar 20 is embedded in the groove 11 of the cover main body 10. With this construction, the nontransparent region 3 locates at an end portion of the groove 11, according to the transparent cover for an image sensor shown in Figs. 1 through 4. On the other hand, as clearly shown in Fig. 2, the glass bar 20 has an upper surface 20a flush with the upper surface 10a of the cover main body 10. Thus, the entire upper

surface of the transparent cover is flat without stepped level differences.

As shown in Fig. 5, the glass bar 20 is bonded to the cover main body 10 via two adhesive layers 4. This reliably fixes the glass bar 20 to the cover main body 10. The adhesive layers 4 are formed by applying a transparent adhesive to two longitudinal side walls 11a of the groove 11. Such an arrangement allows to keep the upper surface 20a and the lower surface 20c of the glass bar 20 free of the adhesive when attaching the glass bar 20 to the transparent cover 1, making it possible to maintain a high transparency thicknesswise of the glass bar 20.

Alternatively to the above, as shown in Fig. 6 for example, the two adhesive layers 4 may be provided on a bottom surface 11b of the groove 11, excluding however, a widthwise center portion of the bottom surface 11b. Such an arrangement also allows maintaining a high thicknesswise transparency of the glass bar 20. Thus, the widthwise center portion of the glass bar 20 allows light to pass appropriately when the transparent cover 1 is used as a part of an image sensor, as will be described later. In the arrangement shown in Fig. 6, preferably, the bottom surface 11b of the groove 11 is formed with recesses 13 of an appropriate depth, and the adhesive layers 4 are formed respectively in the recesses 13. Such can appropriately prevent the glass bar 20 from being raised by as much as the thickness of adhesive, making it easy to make the upper surface 20a of the glass bar 20 flush with the

upper surface 10a of the cover main body 10. Alternatively to the adhesive, the bonding of the glass bar 20 to the cover main body 10 may be achieved by using a double-sided adhesive tape, according to the present invention. Further, the glass bar 20 may not ever be bonded to the cover main body 10. Specifically, the glass cover 20 may be sized to fit the groove 11, and fixed into the cover main body 10 by means of press fitting.

Now, an image sensor according to the present invention will be described with reference to Fig. 7 and Fig. 8.

In Fig. 7, an image sensor A according to the present embodiment is utilized in a sheet feeding type scanner comprising a platen roller 6. In addition to the transparent cover 1 described above, the image sensor A further comprises a case 50, a substrate 51, a plurality of light sources 52, a plurality of light receiving elements 53, and a lens array 54. In Fig. 7, a longitudinal direction of the transparent cover 1 represents a main scanning direction, whereas a direction perpendicular thereto represents a sub scanning direction.

The case 50 is made e.g. of a white synthetic resin, and extends in the main scanning direction as shown in Fig. 8. The case 50 has a light guiding space 50a which is a through hole thicknesswise of the case 50 and extends longitudinally of the case 50. The case 50 is formed with engaging recesses 50b, 50c on its upper surface side (top surface side) for engagement with the engaging projections 12a, 12b of the

transparent cover 1. The engagement between the engaging projections 12a, 12b with the engaging recesses 50b, 50c keeps the transparent cover 1 fixed in the case 50. The light guiding space 50a has an upper opening, which is sealed by the transparent cover 1. The platen roller 6 for feeding a document D in the sub scanning direction indicated by arrows is faced onto the upper surface 20a of the glass bar 20.

The substrate 51 is assembled onto a lower side (bottom side) of the case 50 to seal a lower opening of the light guiding space 50a. The light sources 52 are provided e.g. by LEDs, and placed in a row in the main scanning direction on the substrate 51. With this construction, the light guiding space 50a serves as a passage for light emitted from the light sources 52 for illumination from below the transparent cover 1. As has been described, the case 50 is made of a white synthetic resin, and therefore walls of the light guiding space 50a provides a white reflection surface having a high index of reflectance. The light guiding space 50a has a section capable of guiding the light from the light sources 52 to an entire surface of the glass bar 20 of the transparent cover 1.

The lens array 54 focuses light reflected by the document D, thereby forming a line of image of the document D on the array of the light receiving elements 53. The lens array 54 can be provided e.g. by a plurality of self focusing lenses (known as "selfoc lenses") capable of forming an image of the document without magnification nor inversion. The selfoc

lenses are held in a row by a lens holder. According to the present invention, the selfoc lens array may be replaced by e.g. a convex lens array or an array of other optical lenses. The lens array 54 is fitted into a groove 50d of the case 50, thereby being laid along the main scanning direction. The lens array 54 is provided on the backside of the transparent cover and faced towards the glass bar 20 of the transparent cover 1.

The light receiving elements 53, mounted in a row in the main scanning direction in the upper surface of the substrate 51, have their light receiving surfaces faced toward the lens array 54 and spaced from the lens array 54 by a predetermined distance. Each of the light receiving elements 53 has photoelectric transfer capability, of receiving light focused by the lens array 54 and outputting an image signal having a level corresponding to an amount of the light received. The light receiving elements 53 are surrounded by a black-colored assisting member 55. Since the case 50 is made of a white resin, this arrangement prevents the light from reflecting irregularly on the white walls around the light receiving elements 53 which could cause adverse effect to the read image.

The light receiving elements 53, facing the lens array 53 and disposed in the main scanning direction, can read an image of the document D in a linear region extending in the main scanning direction. This region corresponds to an image reading region S according to the present invention. The

image reading region S also extends in a direction of optical axis (shown by a line indicated by reference code C in Fig. 7) of the lens array 54. Therefore, the image reading region S includes not only the upper surface of the transparent cover but also adjacent regions off the surface in thicknesswise directions of the transparent cover 1. However, in the image sensor A according to the present embodiment, the lens array 54 has a focal point on the upper surface 20a of the glass bar 20, and the transparent cover 1 is so mounted that the groove 11 and the glass bar 20 have their respective widthwise center aligned with the image reading region S.

As shown in Fig. 8, the transparent cover 1 has the nontransparent region 3 at an end portion of the image reading region S that extends in the main scanning direction. The lens array 54 has an end portion 54a defined by a range La, which faces the nontransparent region 3 and includes a plurality of light receiving elements 53 (hereinafter called light-receiving elements for adjustment). These light-receiving elements 53 for adjustment reads an image of the nontransparent region 3, whereas the remaining light receiving elements 53 included in the remaining range Lb performs reading of the document D.

The image sensor according to the present invention performs reading operation as follows: First, in Fig. 7, light is emitted from the light source 52 for reading an image of the document D. The light illuminates the document D placed on the surface 1a of the transparent cover 1 and then is

reflected. Light reflected by the document D in the linear, image-reading region S passes the glass bar 20 of the transparent cover 1, into the image sensor A, and travels toward the lens array 54. The light is then focused by the lens array 54, on the light receiving surfaces of the light receiving elements 53. Since the glass bar 20 has a high hardness, its surface is not easily damaged by contact with the platen roller 6 or other causes. On the other hand, the upper surface 10a of the cover main body 10, which is made of a synthetic resin, is more susceptible to the damage, yet the damage, which is not made in the image reading region S, does not pose a major problem in the image reading operation. Therefore, it becomes possible to minimize the problem of distortion in a read image of the document D due to the surface damage in the transparent cover 1. Further, when the glass cover 20 is fitted into the groove 11 of the cover main body 10, the upper surfaces of the two members are made flush with each other. This eliminates another of the problems that the document D is caught by the surface of the transparent cover 1 and interferes with the reading operation of the document D.

Moreover, the transparent cover 1, made primarily of a synthetic resin that forms the cover main body 10, is light and impact-resistant. This facilitates weight reduction, with the glass bar 20 which is of a small size. Further, the glass bar 20 is embedded in the groove 11, thereby being protected by the cover main body 10. Therefore, not only the

cover main body 10 but also the glass bar 20, of the transparent cover 1 is well protected from crack and other damages. Since the cover main body 10 is made of a synthetic resin, it is easy to provide the cover main body 10 with e.g. the engaging projections 12a, 12b by means of injection molding performed with appropriate metal tooling. Thus, it is possible to form an appropriate shape that facilitates e.g. assembling to the case 50.

According to the image sensor A provided by the present invention, it is possible to perform an output level adjustment for read image, prior to the above described image reading operation of the document D, without using the platen roller 6. Specifically, when performing the output level adjustment for read image, the light sources 52 is turned on without the document D supplied on the transparent cover 1, and image reading operation for the white spot 30 and the black spot 31 in the nontransparent region shown in Fig. 8 is performed. The nontransparent region 3 is located only slightly below the upper surface 20a of the glass bar 20, so an obtained image is only slightly out of focus. The image reading operation of the nontransparent region 3 yields image signal of a high output level for the white spot 30 and image signal of a low output level for the black spot 31. By referring to output levels of these two image signals, it becomes possible to change e.g. a voltage to be applied to the light source 52, thereby making the image signal output level truly correspond to darkness or color tone of the image

in the document D.

Fig. 9 and Fig. 10 are sectional views each showing another embodiment of the image sensor according to the present invention. It should be noted here that in Fig. 9 and thereafter, components identical with those in the previous embodiment will be indicated by the same reference codes and description therefor will not be repeated.

Image sensors Aa shown in Fig. 9 and Fig. 10 differ from the image sensor A according to the previous embodiment in that a document placement position, i.e. a position that allows the lens array 54 to focus the document image, is provided not on the upper surface 20a of the glass cover 20, but slightly below the upper surface 20a by a distance h. All the other aspects are common to those in the image sensor A according to the previous embodiment.

According to an arrangement in the embodiment in Fig. 9, the image sensor Aa is utilized as a component for a handy scanner. In the handy scanner, the case 50 or a frame (not illustrated) that supports the case 50 is provided with a roller (not illustrated), and the surface 1a of the transparent cover 1 is spaced from a document D' by the predetermined distance h. It is for this reason that the focal point of the lens array 54 of the image sensor Aa differs from that of the previous image sensor A. When the image sensor Aa is used as a handy scanner component, the transparent cover 1 of the image sensor Aa is exposed to outside and therefore is prone to impact from being hit by various objects.

However, as has been described, the transparent cover 1 is superior in impact resistance. Further, the image sensor Aa can perform the output level adjustment for the read image by itself, by using the nontransparent region (not illustrated in Fig. 9 but the same as in the previous embodiment). This provides a special advantage in handy scanners which cannot use the platen roller in the output level adjustment.

According to an arrangement in Fig. 10, the image sensor Aa is utilized in a sheet feed type scanner similarly as in the image sensor A. A difference however, is that a transparent glass plate 7 having a thickness H is placed between the platen roller 6A and the transparent cover 1. The embodiment in Fig. 10 uses the image sensor Aa in Fig. 9 without any design changes. For this reason, the thickness H of the transparent glass is selected to satisfy the following equation: $H = \{1 + (n - 1)/n\} h$, where n represents a refractive index of the transparent glass, H represents the thickness thereof, and h represents the distance from the document D' to the surface 1a of the transparent cover. This arrangement enables to obtain well-focused read image, even with the addition of the transparent glass 7.

As has been described, the image sensor according to the present invention can be utilized in whichever one of the sheet feed type scanner and the handy scanner, or can serve both modes. Yet, specific application of the image sensor according to the present invention is not limited by these,

but can include a variety of scanners other than those mentioned above, facsimile machine, and other equipment.

Figs. 11 through 14 are sectional views each showing another embodiment of the transparent cover for image sensor, according to the present invention.

Fig. 11 shows a transparent cover 1A, which comprises the glass bar 20 provided with two nontransparent regions 3A, 3A'. The nontransparent region 3A is provided by a white coating, whereas the other nontransparent region 3A' is provided by a black coating. As described above, according to the present invention, the white spot and the black spot may be provided separately at respective end portions of the glass bar 20.

Note should be made however, that according to the present invention, if the nontransparent region is provided in the transparent cover, the nontransparent cover may not include both of the white spot and the black spot, but may include only one spot colored in white or black. Further, the nontransparent region may not be black or white but may be in another color, although black or white is desirable as a reference color when reading an image for the purpose of read image output level adjustment. Further, the nontransparent region can be provided by other means. For example, color coating a part of the glass bar 20 may be replaced by pasting a nontransparent member to a part of the glass bar 20, such as a piece of nontransparent film or sheet.

Referring now to Fig. 12, according to a transparent cover 1B, a nontransparent member 8 which is separate from the glass

bar 20 is fitted at an end portion of the groove 11 of the cover main body 10. This nontransparent member 8 provides a nontransparent region 3B. Since the nontransparent member 8 should only be fitted into the groove 11, assembling operation to the cover main body 10 can be achieved easily in the same way as for the fitting of the glass bar 20.

Referring to Fig. 13, a transparent cover 1C comprises the cover main body 10, which is formed with two grooves 11, 11a separately from each other. The groove 11 is fitted with the transparent glass bar 20. The other groove 11a is fitted with a nontransparent member 8A, providing the transparent cover 1C including a nontransparent region.

Referring to Fig. 14, according to a transparent cover 1D, the groove 11 is provided by a through hole that penetrates the cover main body 10 thicknesswise. The groove 11 as a through hole further facilitates weight reduction of the transparent cover 1. However, the groove 11 as a through hole decreases strength of the cover main body 10 accordingly. Therefore, in view of increasing overall strength of the transparent cover, it is preferred that the groove be provided not as a through hole.

With some variations described above, specific arrangements in the transparent cover for image sensor and the image sensor according to the present invention are not limited to those described in the embodiments and can be varied in many other ways.

CLAIMS

1. An image sensor comprising:

a transparent cover having a first surface on an image reading region side, and a second surface away from the first surface;

a light source throwing light to the image reading region from a second-surface side of the transparent cover; and

a plurality of light receiving elements each receiving reflected light from the image reading region and outputting an image signal corresponding to an amount of the light received,

characterized that the transparent cover includes a transparent main body of a synthetic resin, and a transparent glass member corresponding to the image reading region, the transparent glass member being exposed on a first surface side of the transparent cover.

2. The image sensor according to Claim 1, wherein the transparent main body has a groove corresponding to the image reading region, the transparent glass member being placed in the groove.

3. The image sensor according to Claim 2, wherein the groove is provided by a through hole formed in the transparent cover.

4. The image sensor according to Claim 2, wherein the transparent main body and the transparent glass member each has a surface flush with each other and providing the first surface.

5. The image sensor according to Claim 2, wherein the image reading region is linear, the transparent cover having a nontransparent region corresponding to at least one end portion of the image reading region.

6. The image sensor according to Claim 5, wherein the nontransparent region is formed with at least one of a white spot and a black spot.

7. The image sensor according to Claim 5, wherein the nontransparent region is formed with both of the white spot and the black spot.

8. The image sensor according to Claim 2, wherein the image reading region is linear, the transparent cover having nontransparent regions respectively corresponding to end portions of the image reading region.

9. The image sensor according to Claim 8, wherein one of the nontransparent regions is formed with a white spot and the other is formed with a black spot.

10. The image sensor according to Claim 5, wherein the nontransparent region is provided by a part of the glass member rendered nontransparent.

11. The image sensor according to Claim 10, wherein the nontransparent region is provided by a part of the glass member applied with a coating.

12. The image sensor according to Claim 10, wherein the nontransparent region is provided by a nontransparent member pasted to a part of the glass member.

13. The image sensor according to Claim 5, wherein the nontransparent region is provided by a nontransparent member separate from the glass member and the cover main body, placed in the groove.

14. The image sensor according to Claim 13, wherein the groove is divided into a glass member receiving portion for receiving the glass member and a nontransparent member receiving portion for receiving the nontransparent member.

15. A transparent cover for image sensor, comprising a transparent main body of a synthetic resin and a transparent glass member placed in a groove formed in a surface of the main body.

16. The transparent cover according to Claim 15, wherein the transparent glass member placed in the groove has a surface flush with a surface of the transparent main body.

17. The transparent cover according to Claim 15, further comprising a nontransparent region provided at least at one longitudinal end portion of the groove.

ABSTRACT

An image sensor (A) comprises a transparent cover (1) having a first surface on an image reading region side, and a second surface away from the first surface; a light source (52) throwing light to the image reading region from a second-surface side of the transparent cover; and a plurality of light receiving elements (53) each receiving reflected light from the image reading region and outputting an image signal corresponding to an amount of the light received. The transparent cover (1) includes a transparent main body (10) of a synthetic resin, and a transparent glass member (20) corresponding to the image reading region. The transparent glass member (20) is exposed on a first surface side of the transparent cover (1).

09/890758

FIG.1

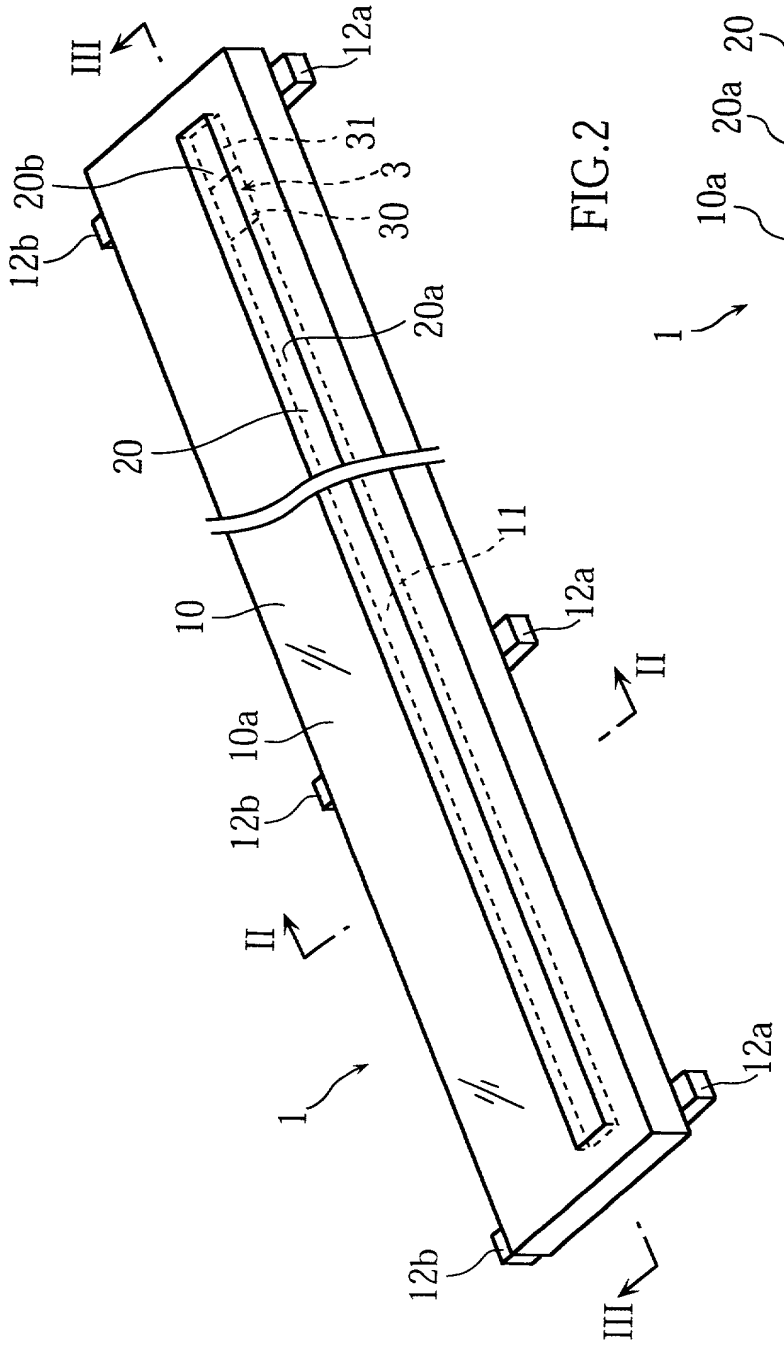

FIG.2

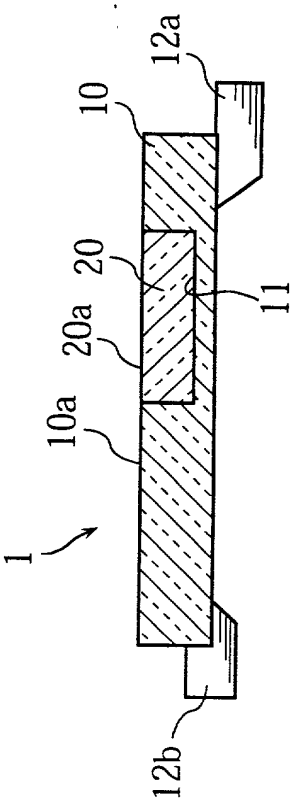

FIG.3

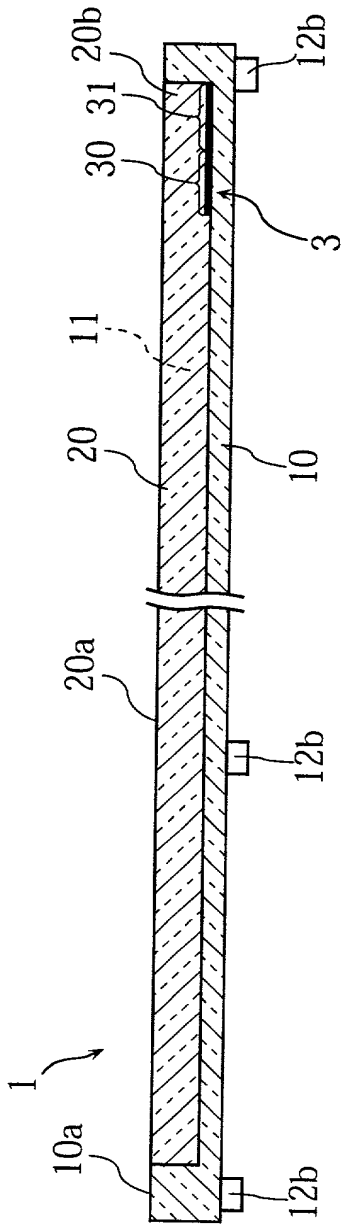

FIG.4

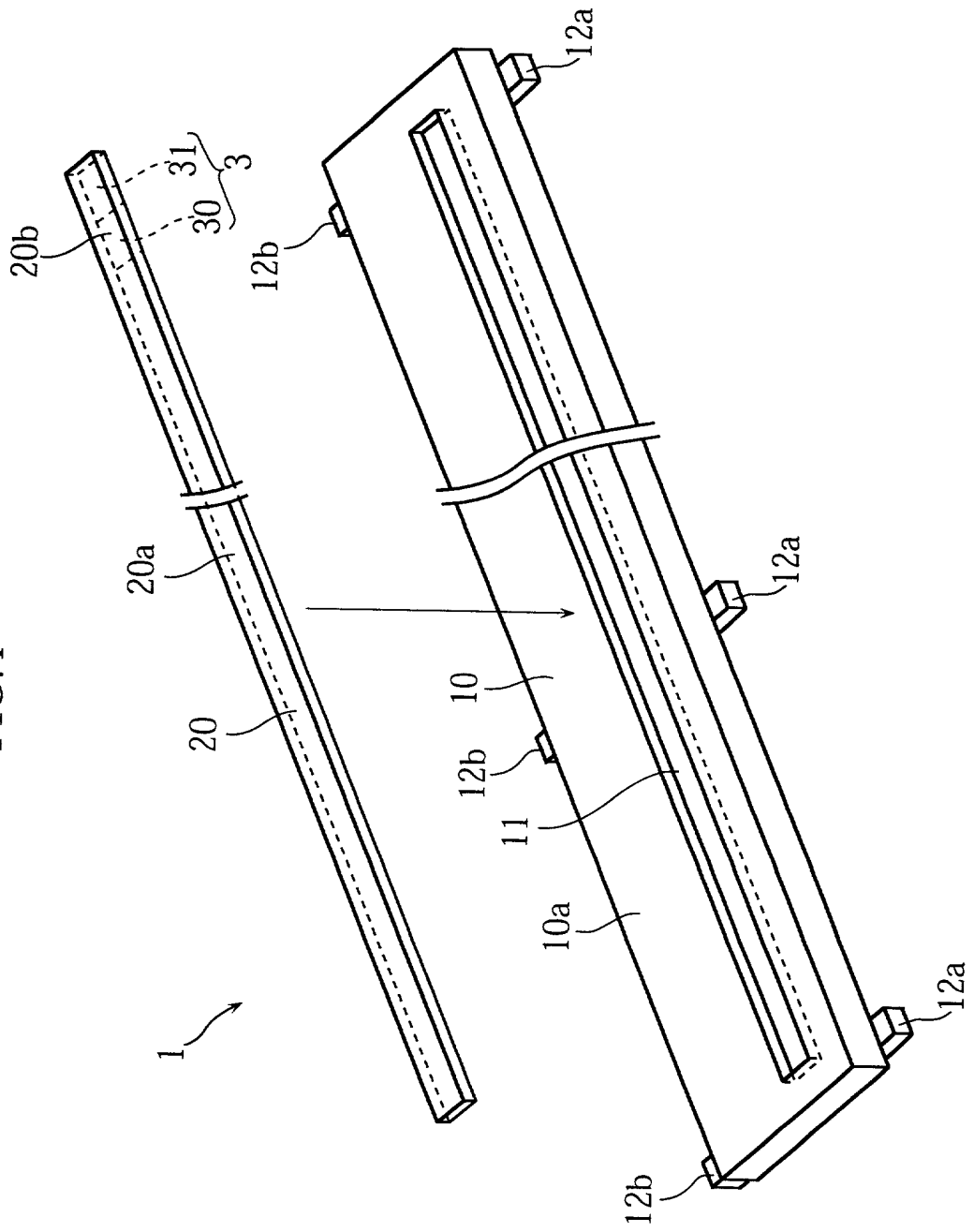

FIG.5

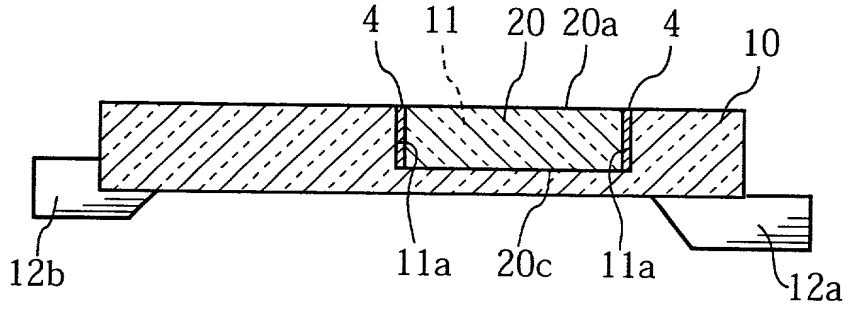

FIG.6

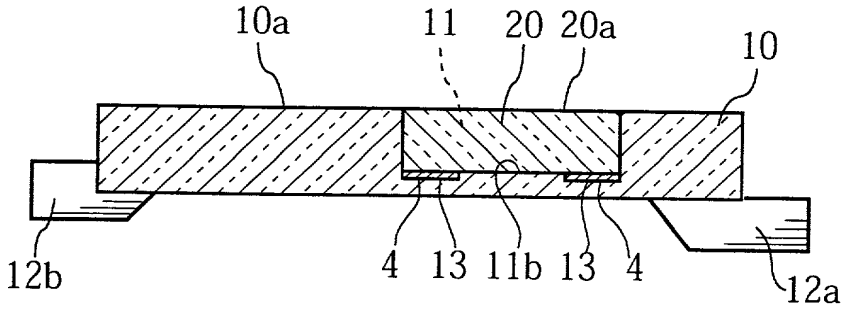

FIG.7

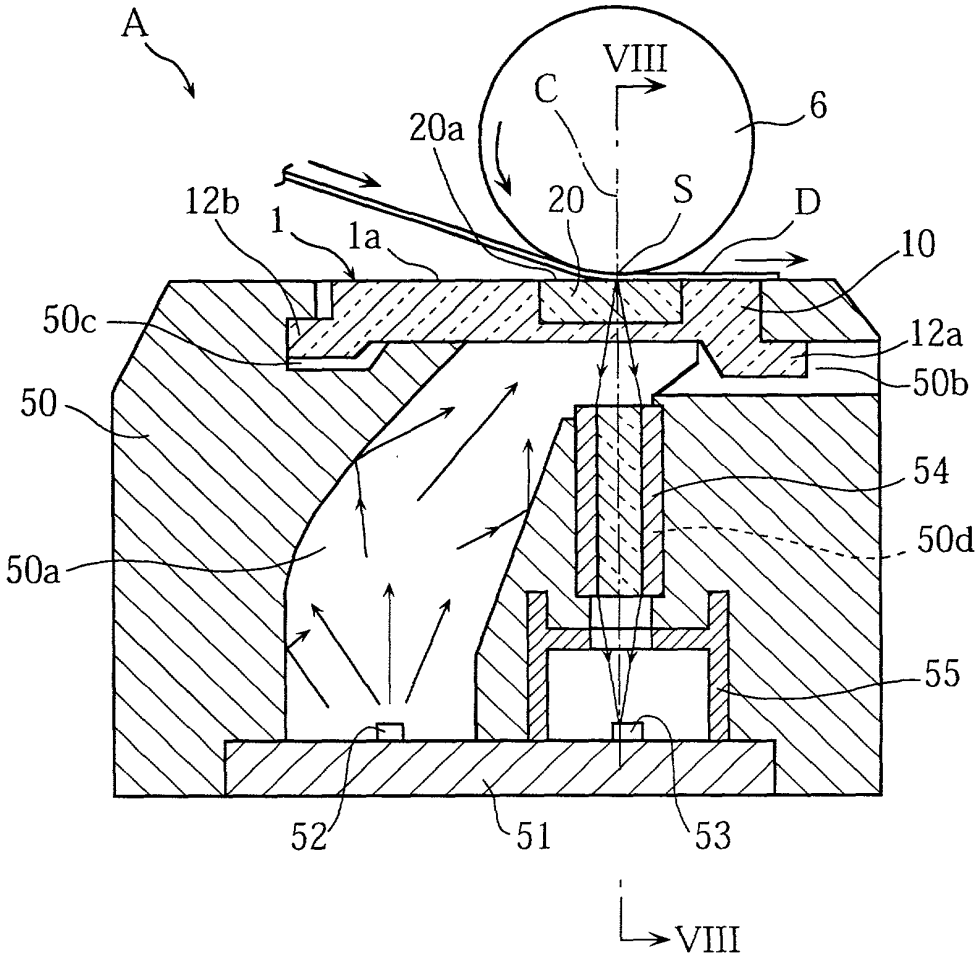

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FIG.8

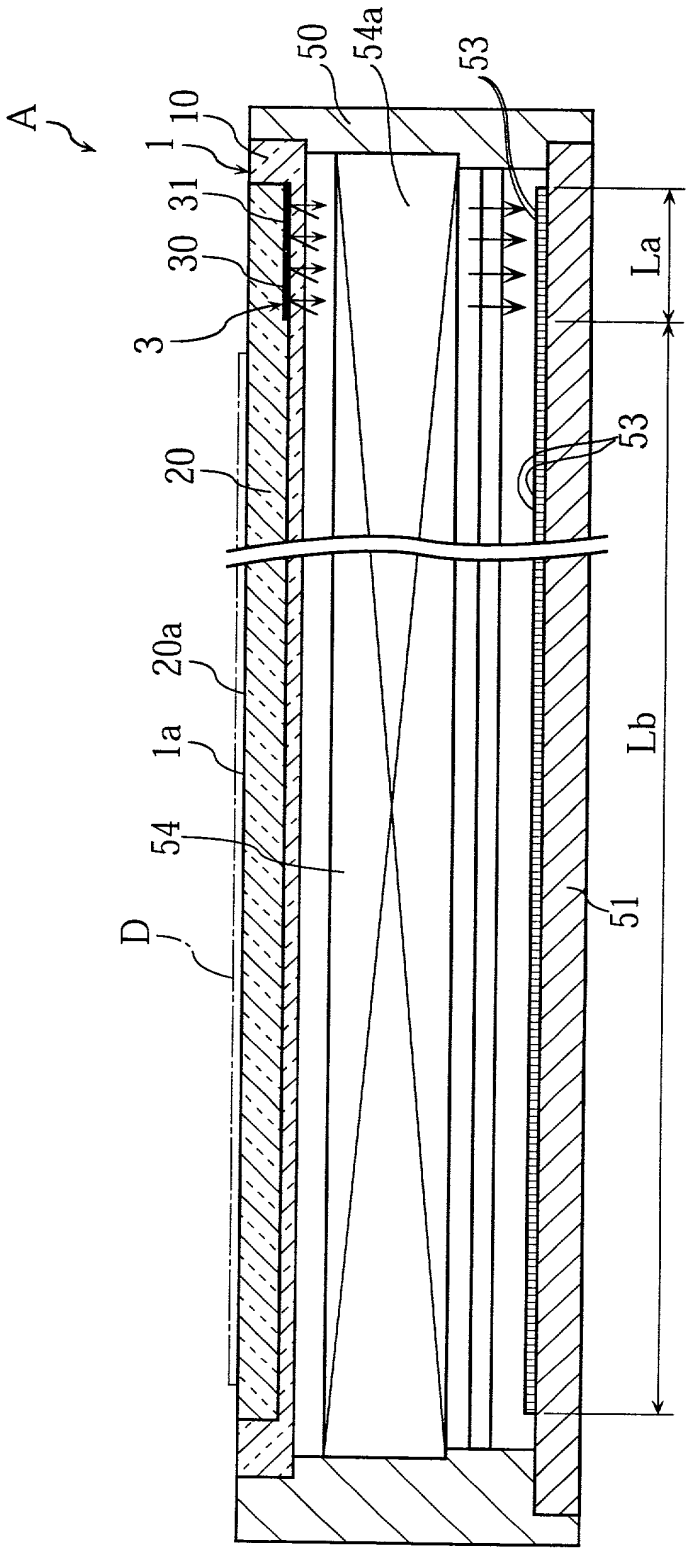


FIG.9

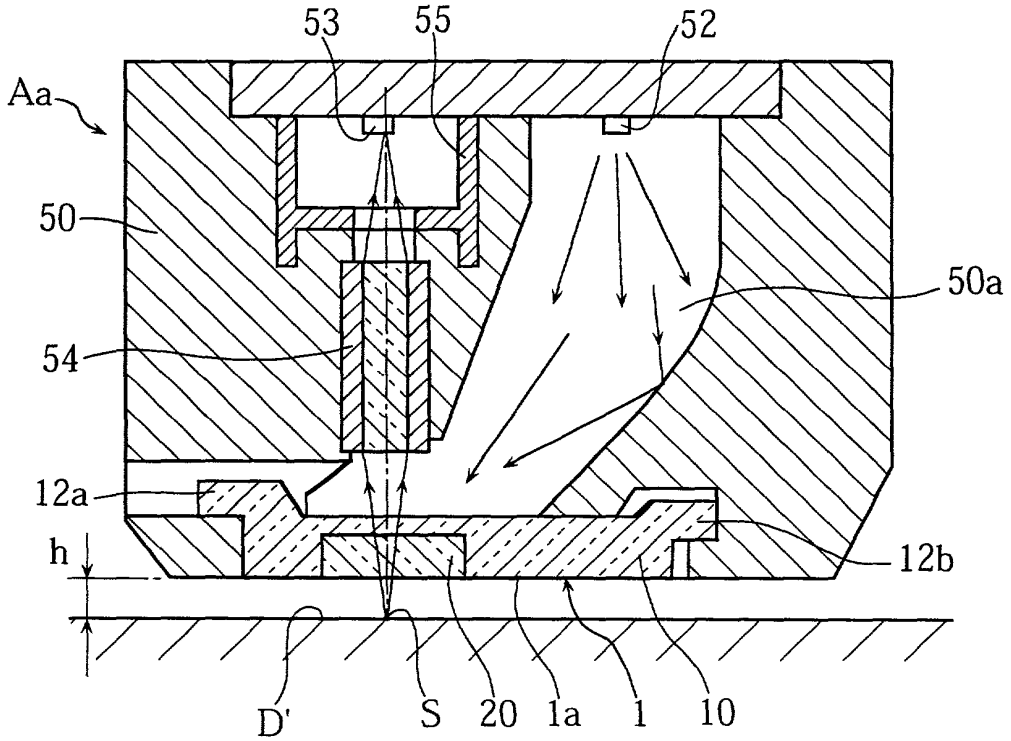


FIG.10

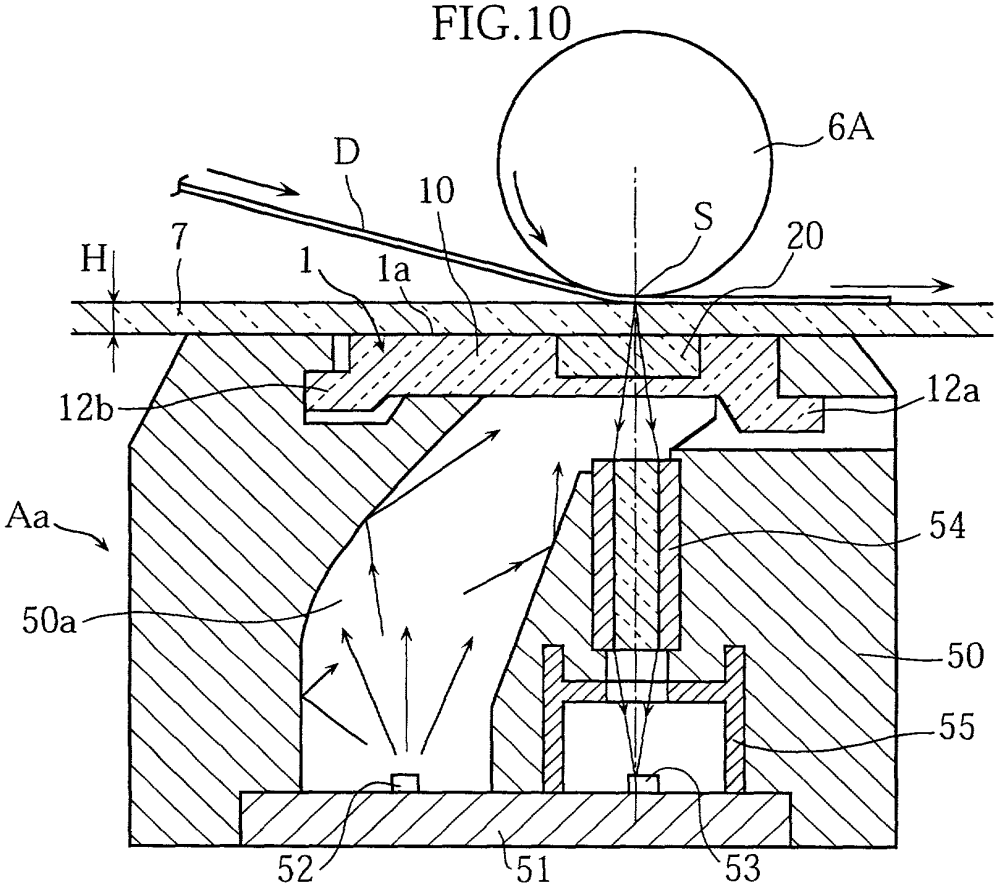


FIG.11

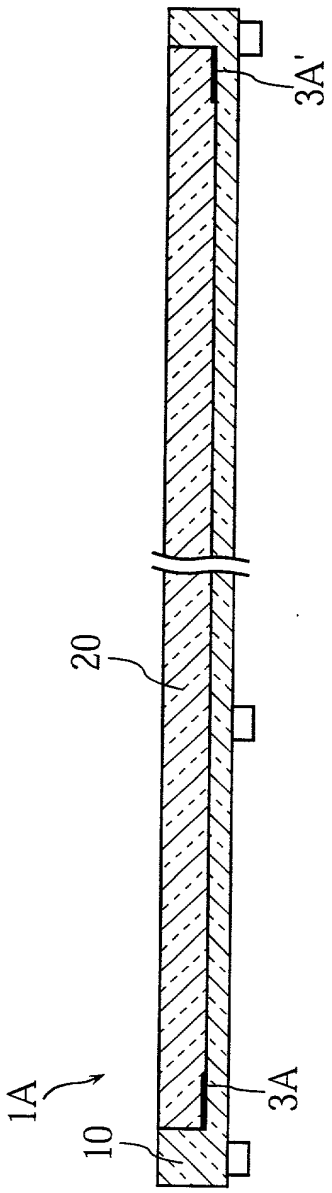
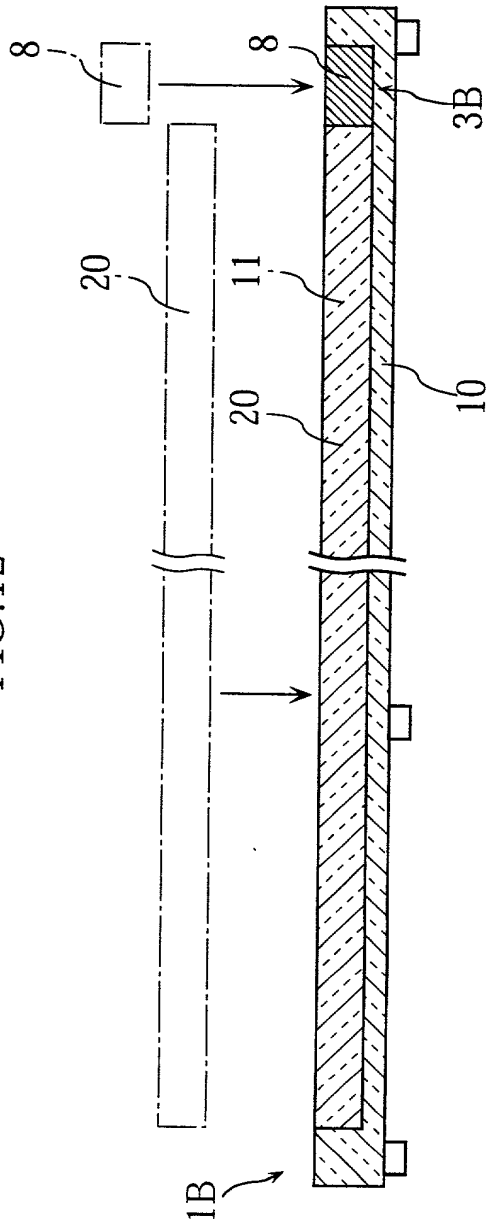


FIG.12



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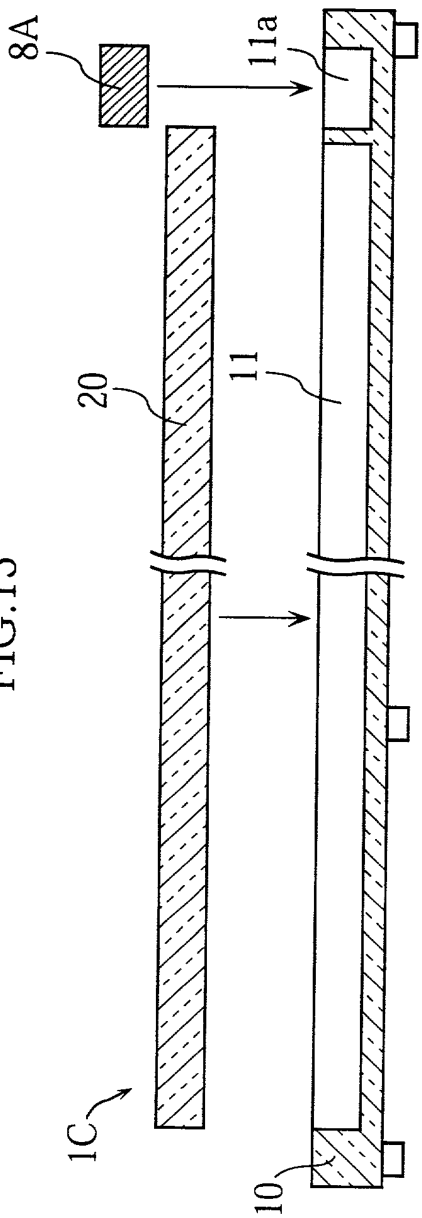

FIG.13

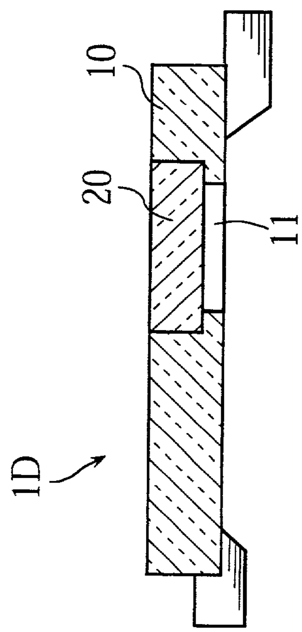

FIG.14

International Application No.: PCT/JP00/00578

International Filing Date: February 2, 2000

Assignee: Rohm Co., Ltd.

Title of the Invention: IMAGE SENSOR AND TRANSPARENT COVER FOR THE SAME

DECLARATION

I, Yukio UENO, hereby declare:

that I am a professional translator residing in Osaka, Japan;

that I am well acquainted with both the Japanese and English languages;

that, for entering the national phase of the above-identified international application, I have prepared an English translation of the Japanese specification and claims as originally filed with the Japanese Patent Office (Receiving Office) and as amended under PCT Article 34; and

that the said English translation corresponds to the said Japanese specification and claims to the best of my knowledge.

I also declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statements is directed.

Declared at Osaka, Japan on July 16th, 2001

By Yukio Ueno

Signature Yukio Ueno

Declaration and Power of Attorney For Patent Application

特許出願宣言書

Japanese Language Declaration

私は、下欄に氏名を記載した発明者として、以下のとおり宣言する：

As a below named inventor, I hereby declare that:

私の住所、郵便の宛先および国籍は、下欄に氏名に続いて記載したとおりであり、

My residence, post office address and citizenship are as stated below next to my name,

名称の発明に関し、請求の範囲に記載した特許を求める主題の本来の、最初にして唯一の発明者である（一人の氏名のみが下欄に記載されている場合）か、もしくは本来の、最初にして共同の発明者である（複数の氏名が下欄に記載されている場合）と信じ、

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

IMAGE SENSOR AND TRANSPARENT COVER FOR THE SAME

その明細書を
（該当する方に印を付す）

☐ここに添付する。

the specification of which
(check one)
☐is attached hereto.

☐＿＿＿＿＿＿日に出願番号
第＿＿＿＿＿＿号として提出し、
＿＿＿＿＿＿日に補正した。
（該当する場合）

☐was filed on ＿＿＿＿＿＿ as Application Serial No. ＿＿＿＿＿＿ and was amended on ＿＿＿＿＿＿
(if applicable)

☐＿＿＿＿＿＿日にＰＣＴ国際出願番号
第＿＿＿＿＿＿号として提し、
ＰＣＴ第19条に基づき＿＿＿＿＿＿日に補正た。
（該当する場合）

☒was described and claimed in PCT international application No. PCT/JP00/00578 filed on February 2, 2000 and as amended under PCT Article 19 or 34 on October 13, 2000
(if applicable)

私は、前記のとおり補正した請求の範囲を含む前記明細書の内容を検討し、理解したことを陳述する。

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

私は、連邦規則法典第37部第１章第56条（a）項に従い、本願の審査に所要の情報を開示すべき義務を有することを認める。

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

Japanese Language Declaration

私は、合衆国法典第35部第119条（a）－（d）項または第365条（a）－（b）項にもとづく下記の外国特許出願または発明者証出願または少なくとも１つの合衆国以外の国を指定したＰＣＴ国際出願の外国優先権利益を主張し、さらに優先権の主張に係わる基礎出願の出願日前の出願日を有する外国特許出願または発明者証出願またはＰＣＴ国際出願を以下に明記する：

I hereby claim foreign priority benefits under Title 35, United States Code, § 119(a)-(d) or § 365(a)-(b) of any foreign application(s) for patent or inventor's certificate, or of any PCT international application which designated at least one country other than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate or PCT international application having a filing date before that of the application on which priority is claimed:

Prior foreign applications
先の外国出願

(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)	Priority claimed 優先権の主張
Patent Application No. 11-34349	Japan	12/2/1999	☒ Yes あり ☐ No なし
			☐ Yes あり ☐ No なし
			☐ Yes あり ☐ No なし
			☐ Yes あり ☐ No なし
			☐ Yes あり ☐ No なし
			☐ Yes あり ☐ No なし

私は、合衆国法典第35部第120条にもとづく下記の合衆国特許出願の利益または第365条（c）項にもとづく合衆国を指定するＰＣＴ国際出願の利益を主張し、本願の請求の範囲各項に記載の主題が合衆国法典第35部112条第１項に規定の態様で先の合衆国出願に開示されていない限度において、先の出願の出願日と本願の国内出願日またはＰＣＴ国際出願日の間に公表された連邦規則法典第37部第１章第56条（a）項に記載の所要の情報を開示すべき義務を有することを認める：

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT international application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.) (出願番号)	(Filing Date) (出願日)	(現況) (特許済み、係属中、放棄済み) (Status) (patented, pending, abandoned)

Japanese Language Declaration

私は、ここに自己の知識にもとづいて行った陳述がすべて真実であり、自己の有する情報および信ずるところに従って行った陳述が真実であると信じ、さらに故意に虚偽の陳述等を行った場合、合衆国法典第18部第1001条により、罰金もしくは禁固に処せられるか、またはこれらの刑が併科され、またかかる故意による虚偽の陳述が本願ないし本願に対して付与される特許の有効性を損なうことがあることを認識して、以上の陳述を行ったことを宣言する。

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

委任状：私は、下記発明者として、以下の代理人をここに選任し、本願の手続を遂行すること並びにこれに関する一切の行為を特許商標庁に対して行うことを委任する。（代理人氏名および登録番号を明記のこと）

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and /or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

Albrecht, John W.	Reg. No. 40,481	Hamre, Curtis B.	Reg. No. 29,165	Qualey, Terry	Reg. No. 25,148
Ali, M. Jeffer	Reg. No. 46,359	Harrison, Kevin C.	Reg. No. P-46,759	Reich, John C.	Reg. No. 37,703
Anderson, Gregg I.	Reg. No. 28,828	Hertzberg, Brett A.	Reg. No. 42,660	Reiland, Earl D.	Reg. No. 25,767
Batzli, Brian H.	Reg. No. 32,960	Hillson, Randall A.	Reg. No. 31,838	Samuels, Lisa A.	Reg. No. 43,080
Beard, John L.	Reg. No. 27,612	Holzer, Jr., Richard J.	Reg. No. 42,668	Schmaltz, David G.	Reg. No. 39,828
Berns, John M.	Reg. No. 43,496	Johnston, Scott W	Reg. No. 39,721	Schuman, Mark D.	Reg. No. 31,197
Black, Bruce E.	Reg. No. 41,622	Kadievitch, Natalie D	Reg. No. 34,196	Schumann, Michael D.	Reg. No. 30,422
Branch, John W.	Reg. No. 41,633	Karjeker, Shaukat	Reg. No. 34,049	Scull, Timothy B.	Reg. No. 42,137
Bremer, Dennis C.	Reg. No. 40,528	Kastelic, Joseph M.	Reg. No. 37,160	Sebald, Gregory A.	Reg. No. 33,280
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Byrne, Linda M.	Reg. No. 32,404	Keys, Jeramie J.	Reg. No. 42,724	Spellman, Steven J.	Reg. No. 45,124
Campbell, Keith	Reg No. P-46,597	Knearl, Homer L	Reg. No. 21,197	Stoll-DeBell, Kirsten L.	Reg. No. 43,164
Carlson, Alan G.	Reg. No. 25,959	Kowalchyk, Alan W	Reg No. 31,535	Sumner, John P.	Reg. No. 29,114
Caspers, Philip P.	Reg No. 33,227	Kowalchyk, Katherine M.	Reg. No 36,848	Swenson, Erik G.	Reg. No. 45,147
Chiapetta, James R.	Reg No. 39,634	Lacy, Paul A.	Reg. No. 38,946	Tellekson, David K.	Reg. No. 32,314
Clifford, John A.	Reg. No. 30,247	Larson, James A.	Reg. No. 40,443	Trembath, Jon R.	Reg. No. 38,344
Daignault, Ronald A.	Reg. No. 25,968	Leon, Andrew J.	Reg. No. P-46,869	Tuchman, Ido	Reg. No. 45,924
Daley, Dennis R.	Reg. No. 34,994	Leonard, Christopher J.	Reg. No. 41,940	Underhill, Albert L.	Reg. No. 27,403
Dalglish, Leslie E.	Reg. No. 40,579	Liepa, Mara E.	Reg No 40,066	Vandenburgh, J. Derek	Reg No. 32,179
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